USING AN INTERACTIVE LEARNING BOOK BASED ON INTERACTIVE AND DISCOVERY LEARNING TO ENHANCE STUDENT INTERACTION AND ACHIEVEMENT

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Abstract

This research aimed 1) to develop an interactive learning book based on interactive learning and discovery learning and 2) to examine student interaction and achievement after using an interactive learning book. The purposive sample group was 20 undergraduate students. Instruments were an interactive learning book, a content-appropriateness questionnaire, an observation checklist, pre-test and post-test, and a satisfaction questionnaire. Data were analyzed by using mean, standard deviation, t-test, and content analysis. The research results were 1) an interactive learning book was verified by experts as high quality at 4.33 and piloted with high satisfaction at 4.46. 2) The means of interactive learning observed by a teacher was high in interaction at 3.80. The mean of discovery learning was high at 4.26. The post-test scores were higher than before, significantly different at 0.05. The results indicate that an interactive learning book based on interactive learning and discovery learning can enhance student interaction and achievement with positive impact.

Keywords: Interactive Learning Book, Interactive Learning, Discovery learning, Student Interaction, Achievement

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INTRODUCTION

Knowledge and skills students learn today will probably be out-of-date by the time they graduate and there will be more new knowledge and skills required in the future after they graduate. How can students acquire a learning ability to continue to learn and stay current with the new knowledge and skills required for the 21st century? How can teachers teach students to possess that learning ability?

At present, the skills and knowledge students need to succeed in work, life, and citizenship in the 21st century are key subjects, 21st century themes, life and career skills, learning and innovation skills, information and technology skills. Teaching and learning should thus be aligned to equip students with effective learning ability to master the knowledge and skills necessary to succeed in work and life in the 21st century (P21, n.d).

At present, teaching expects from an individual continuous learning, creativity and exploration. Students are expected not only to manage their own potentials, knowledge, skills, and habits, but also to discover and examine their own talents and areas of interest (Roeders, 2003). Students themselves are also intensely social and interactive learners (Taylor & Parsons, 2011). Today's learners ask for the opportunity to explore and to find solutions and answers for themselves (Windham, 2005).

All this requires an environment that is rich (positive) in stimuli and challenges (Roeders, 2003) to help students learn better.

In response to this, there has been an emergence of a new way of teaching and learning that helps teachers teach students to learn best and helps students learn and keep up with the new knowledge and skills required for the 21st century to succeed in work, life and citizenship.

Reeve and Hedberg (2003) points out that all learning is interactive. Therefore, if an interactive learning environment is created, learning will come. With an interactive learning environment, learners remain active because actions are required in order to learn. All knowledge is tied to action through interaction: Von Glasersfeld (1995) stated that interaction provides knowledge, and that this knowledge, through further interaction, becomes better.

Bruner (1966) stated that every individual has the will to learn and this principle should be used to construct such activities that raise curiosity and direct students to study and discover knowledge. Learning happens by discovery, which prioritizes reflection, thinking, experimenting, and exploring. Discovery learning works because it ensures that learners' brains are engaged while discovering knowledge.

Discovery learning in an interactive learning environment is therefore considered a learning strategy that guides and motivates learners to explore information and concepts in order to construct new ideas, identify new relationships, and create new models of thinking and behavior. It is the new way of learning, in which learners are provided with the potential tools and encouraged to discover knowledge interactively and in doing so, their knowledge will be current at all times and the students will become lifelong learners in a knowledge-based society (Gilbert, 2007). Classrooms where students are taught to discover knowledge by themselves can yield positive impacts on motivational values compared to teacher-centered classrooms where knowledge is given in the class only (Rezak, 2009).

Due to the significance and reasons given above, this research focused on developing an interactive learning book based on interactive learning and discovery learning and then examining how it can be used for effective teaching and learning to enhance student interaction and achievement. It is anticipated that the results will be useful for effectively teaching students to be lifelong learners in a knowledge-based society.

RESEARCH OBJECTIVES

1.1 To develop an interactive learning book based on interactive learning and discovery learning

1.2 To examine student interaction and achievement after using an interactive learning book

METHODOLOGY

The research was conducted in two stages as follows:

Stage 1 - develop an interactive learning book based on interactive learning and discovery learning

Step 1.1 – Study source of data

This step involved documentary research by reviewing related theories and principles of interactive learning, discovery learning, and human resource management from books, websites, journals, and related research.

Step 1.2 – Data Collection and Developing an Instrument

This step involved identifying key points from step 1.1 to build a proper developmental framework.

A paper-based interactive learning book was then developed. It consisted of interactive learning and discovery learning activities, including an overview of learning to help students translate their interactions into learning.

For interactive learning, student were assigned learning activities where students would reflect, think, experiment, and explore topics in each section.

For discovery learning, students were encouraged to integrate and connect their learning, manage their own learning, and solve problems through given learning activities, such as case studies, simulations, incidents, explorations, and reflections.

There were 9 topics, namely, importance and definition of human resource management, objectives, roles, internal and external factors influencing human resource management, trends, characteristics of human resource management professionals, competencies, human resource management process and its application. Each topic contained 1 to 3 pages. Each page contained 1 learning activity. Four weeks were given for students to interact with all the learning activities in the interactive learning book.

In this stage, there were three instruments used: the interactive learning book, a content-appropriateness questionnaire, and a satisfaction questionnaire. The interactive learning book was assessed by experts through a content-appropriateness questionnaire. The book was piloted with a non-targeted group of students to test usability and to gauge their satisfaction through a satisfaction questionnaire, which consisted of 13 items including open-ended answers.

Step 1.3 – Analysis of Data

To assess the validity and consistency of the instrument, subject-matter experts (content) determined whether the instrument covered the basic requirements of interactive learning and

discovery learning that were targeted requirements for evaluation. A questionnaire collecting experts' opinions on content appropriateness with five-point Likert scale was used. Results of content appropriateness were analyzed by mean, standard deviation, and content analysis. The interactive learning book was then revised according to experts' recommendations. Results of satisfaction and related comments were analyzed by mean, standard deviation, and content analysis. All results were brought into consideration for improvement.

Stage 2 - examine student interaction and achievement after using an interactive learning book

Step 2.1 – Selecting and identifying the targeted study group

The human resource management subject was selected as it was a mandatory subject. Furthermore, it is an important subject to help build necessary knowledge and skills for work and life in the future.

Therefore, students who enrolled in this subject were selected as the sample group. However, the researcher was aware that the research findings were specific to this study and the study's findings may not applicable to other groups and subjects due to the limitations created by this purposive sampling.

Step 2.2 – Developing the instruments

In this stage, three instruments were used to examine student interaction and achievement.

The first instrument was a writing test, used as both a pre-test and post-test to examine student achievement. It was developed by the researchers to measure knowledge of the subject. It contained 1 complex "what if" scenario about designing a workplace with effective human resource management. Total scores were 100. The scoring procedure focused on judging the level of explanation and examples given. Three hours were given to complete the pre- and post-tests.

The second instrument was the teacher observation checklist based on discovery learning using a five-point Likert scale to examine the use of the interactive learning book to promote student interaction. It focused on 4 learning activities (reflection, thinking, experimenting, and exploring) to create an interactive learning environment.

The third instrument was the five-point Likert scale questionnaire on interactive learning and discovery learning completed by the sample group. There were 2 of the survey:

Part 1 focused on 8 dimensions under 2 major areas.

Area 1 consisted of the overview of learning with 3 dimensions as follows:

1. Opinions on integrating and connecting what students learned
2. Opinions on learner management of what they learned
3. Opinions on problem solving from what they learned

Area 2 consisted of the learning activities with five dimensions as follows:

4. Opinions on simulation-based learning to learn skills by doing and preparing for real life
5. Opinions on incidental learning based on the creation of tasks with inherently interesting end results that and which can be used to impart dull information
6. Opinions on reflection to help teachers open the student's eyes to new ways of thinking about a given situation and to help the students articulate their thoughts on given situation

7. Opinions on case-based teaching, in which students know exactly what they need to know when they need to know it and learn by doing, experiencing knowledge failures, and realizing the need for new information in order to progress

8. Opinions on learning by exploring, in which students can be involved in their own learning and learn through performing tasks that they care about

Part 2 was the open ended answers for further recommendation.

All instruments were verified by experts to obtain their recommendations for necessary changes.

Step 2.3 – Data Collection

The targeted study group attended the pre-test. After the pre-test, an interactive learning book was given to students with instructions on how to use and how to complete related questionnaires.

The researcher, as a teacher, used an observation checklist to observe student interaction.

After students completed the interactive learning book, they were given the post-test and the questionnaire of interactive learning and discovery learning. Finally, all instruments distributed were checked for completeness and accuracy.

Step 2.4 – Data Analysis

Content analysis was used for analyzing qualitative data and mean and standard deviation analysis were used for analyzing quantitative data. Pre- and post-test scores were analyzed by using content analysis and compared by using t-test. A five-point Likert scale observation checklist assessing discovery learning and a questionnaire assessing interactive learning and discovery learning indicated the level of student interaction, ranging from 1 (very low) to 5 (very high). The scales used in the data interpretation are shown below.

Average Score Interval	Meaning
4.50-5.00	Very high
3.50-4.49	High
2.50-3.49	Average
1.50-2.49	Low
1.00-1.49	Very Low

RESULTS

The research results were presented as follow:

1. To develop an interactive learning book based on interactive learning and discovery learning

1.1 The book was developed with a developmental framework of interactive learning, discovery learning, and human resource management.

The book was analyzed by 3 experts for content appropriateness. The experts agreed upon changes in page number and instruction clarity. After revision, the experts stated that the content was appropriate.

Table 1: Means and Standard Deviation of Content Appropriateness

Content Appropriateness	$\bar{X}$	S.D.	Interpretation
1. Content is appropriate to the selected subject	4.67	0.58	Very High
2. Content is appropriate in its presentation	4.33	0.58	High
3. Content is appropriate to use with interactive learning and discovery learning	4.00	0.00	High
Total	4.33	0.00	High

Table 1 shows that the mean was 4.33 and standard deviation (S.D.) was 0.00. This means that the content appropriateness was at a high level.

1.2 The book was piloted with a non-targeted group of 17 students with the high satisfactory level of 4.46.

The data analysis in Table 2 shows a mean of 4.46 and a standard deviation (S.D.) of 0.55. This means that the non-targeted group of 17 students was highly satisfied with the interactive learning book.

In the open-ended answer section of the student satisfaction survey, the students responded with words and phrases like good, interesting, logical, fun-filled with learning activities, easy to understand, and a motivating way to search for knowledge and participate in the learning process.

1.3 The final used a version of test that was revised according to expert recommendations and the non-targeted group of students: The final version contained 34 pages, excluding the cover page, instruction page, and back page. Each page featured 1 learning activity appropriate to the page in order to guide students. However, students were allowed to use another learning activity or activities instead of the indicated learning activity, if appropriate.

Table 2: Means and Standard Deviation of Non-Targeted Group of Students' Satisfaction

Student Satisfaction	$\bar{X}$	S.D.	Interpretation
1. It encourages student interaction in classroom	4.41	0.62	High
2. It is understandable, clear, and easy to learn	4.24	0.66	High
3. It is modern	4.35	0.70	High
4. It provides appropriate content	4.47	0.62	High
5. It has the right balance of content	4.50	0.52	Very High
6. It is in a creative style	4.65	0.49	Very High
7. It communicates clearly and creatively	4.47	0.62	High
8. It stimulates interest in learning	4.47	0.62	High
9.It encourages knowledge discovery	4.65	0.49	Very High
10.It encourages thinking and easiness to follow	4.35	0.70	High
11.It supports learning by doing	4.41	0.62	High
12.It encourages self- learning	4.53	0.51	Very High
13.It leads to learning	4.53	0.51	Very High
Total	4.46	0.55	High

Some examples from a revised version of the interactive learning book used in this study are given below.

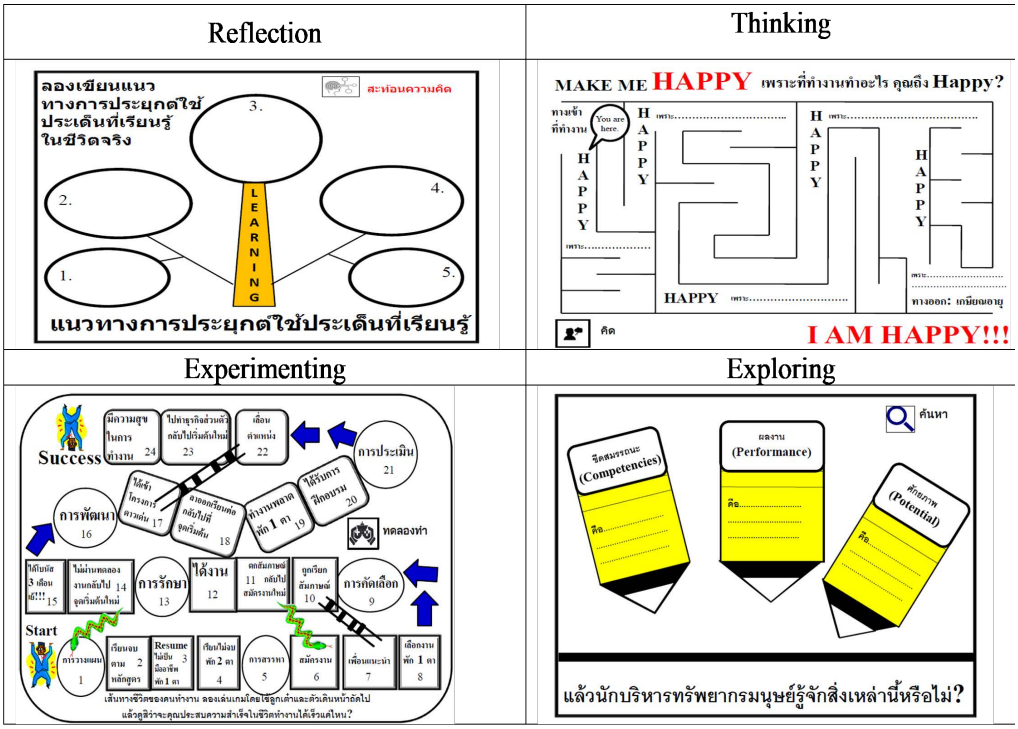

Figure 1: Examples from the Interactive Learning Book

Overview of Learning
Integrating and Connecting During and after performing tasks from the interactive learning book, the teacher encouraged the students and checked how they integrated and connected what they learned with their real-life situations. The students were given opportunities to explore, create and generalize knowledge, integrate that knowledge, and connect to the real world by connecting human resource management content with their own context.
Learner Management Learners had to manage themselves. Four times they were observed by a teacher in class. Out of class management depended on learner accountability, which meant that students could learn according to their own styles and at their own learning speeds.
Problem Solving The interactive learning book was designed with a variety of learning activities guiding and motivating learners to participate in problem solving. Each page indicated a learning activity with tasks and guided students on what to do. Students needed to find their own answers and solutions to these tasks.

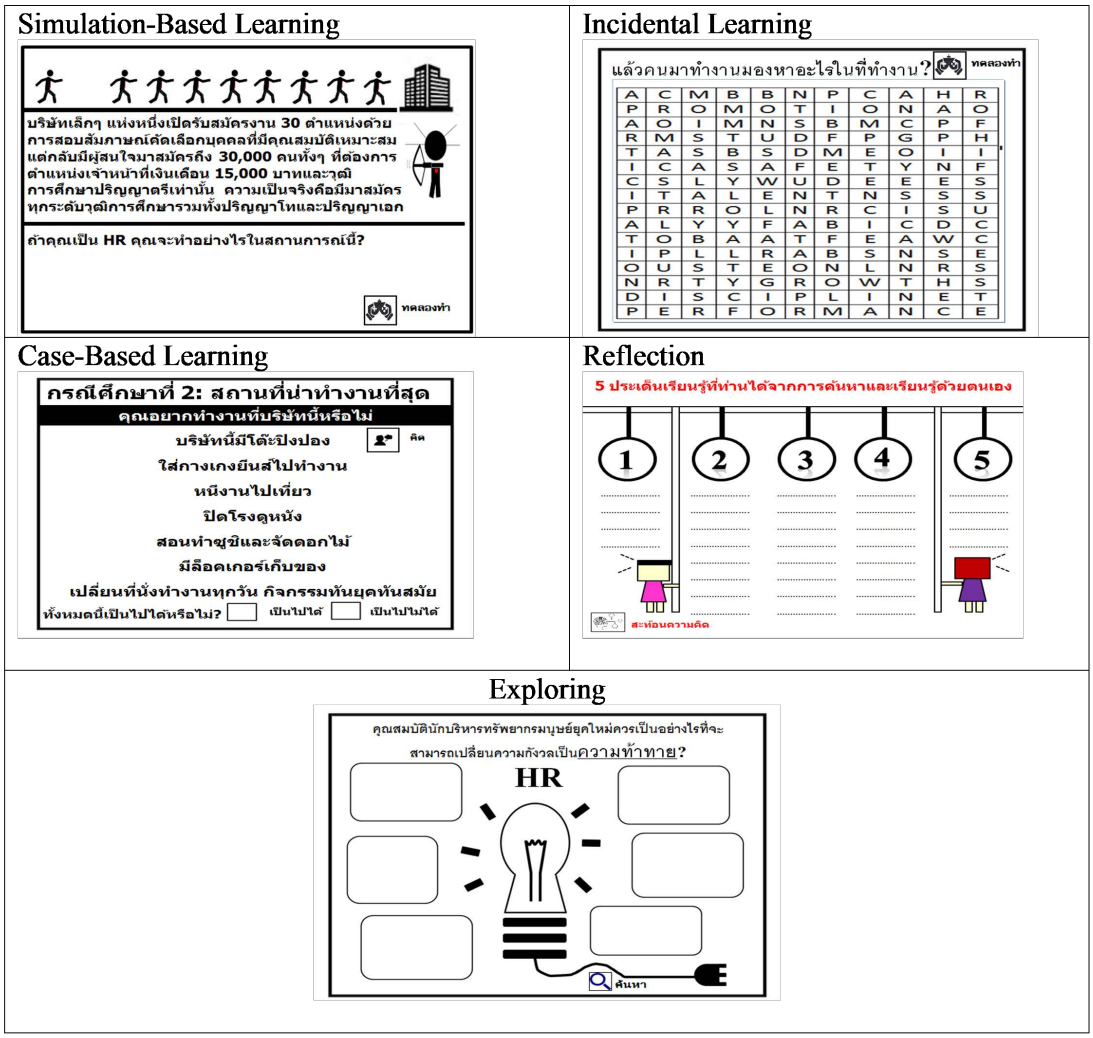

Figure 2: Examples from the Interactive Learning Book

2. To examine student interaction and achievement after using the interactive learning book

2.1. Student interaction based on discovery learning: Teacher observation of classes was done 4 times by using the observation checklist to monitor student interaction levels. The results are shown in Table 3.

Table 3: Means and Standard Deviation of Discovery Learning

Interactive Learning	$\bar{x}$	S.D.	Interpretation
Reflection	3.80	0.47	High in interaction
Thinking	3.91	0.46	High in interaction
Experimenting	3.89	0.68	High in interaction
Exploring	3.59	1.03	High in interaction
Total	3.80	0.15	High in interaction

Table 4 – Student Achievement Before and After Using the Interactive Learning Book

	$\bar{x}$	S.D.	t	P
Pre-Test	48.00	22.15	6.25	0.0000
Post-Test	77.00	9.79		

The data analysis in Table 3 showed that from 4 class observations the mean was 3.80 and the standard deviation (S.D.) was 0.15. This means that student interaction based on discovery learning was at a high level.

2.2. Measurement of student achievement after the use of the interactive learning book through a pre-test and post-test: The full scores of both tests were 100. Post-test scores were higher than pre-test scores. The gap difference of the mean is shown in Table 4.

As shown in Table 4, the probability significance of 0.0000 is less than 0.05, which means that there are significant differences between pre-test and post-test scores. Student achievement after the use of the interactive learning book was higher than before, significantly different at 0.05.

2.3 Student interaction based on discovery learning: Student opinions on the interactive learning book based on discovery learning were assessed with five-point Likert scale questions as follows:

Table 5: Means and Standard Deviations of Students' Opinions on Interaction in Using the Interactive Learning Book based on Interactive Learning and Discovery Learning

Item	$\bar{x}$	S.D.	Interpretation
1. The interactive learning book promotes interactive participation by integrating and connecting knowledge of what students learn	4.38	0.72	High
2. The interactive learning book promotes interactive participation by involving the learner and enabling the learner to manage their own learning	4.38	0.50	High
3. The interactive learning book promotes interactive participation by enabling learners to solve problems	4.13	0.62	High
4. The interactive learning book promotes interactive participation through simulation-based learning	4.25	0.68	High
5. The interactive learning book promotes interactive participation through incidental learning	4.25	0.68	High
6. The interactive learning book promotes interactive participation by learning through reflection	4.44	0.51	High
7. The interactive learning book promotes interactive participation through case-based learning	4.20	0.68	High
8. The interactive learning book promotes interactive participation by learning through exploring	4.38	0.62	High
Total	4.26	0.17	High

Table 5 shows a total mean of 4.26 and the standard deviation (S.D.) was 0.17. This means that students interacted with learning activities based on interactive and discovery learning. Their interaction was at a high level.

Assessment of student interaction from open-ended answers are presented as follows:

1. The interactive learning book was a good instructional media tool for teaching as it helped learners keep content for reviewing, summarizing, and concluding.

2. The interactive learning book was a good instructional media tool for learning as it helped learners develop learning skills such as thinking, analyzing, and applying.

3. The interactive learning book was a good instructional media tool for teaching and learning as it helped teachers motivate learners to engage themselves in the learning process and helped learners participate in learning activities such as searching for knowledge and sharing answers.

DISCUSSION

For this study, an interactive learning environment was created by a teacher through the use of the interactive learning book and discovery learning. Learners learnt successfully in this environment because learning was set to be interactive with various learning activities, and learners learn best when they learn interactively. As Reeves and Hedberg (2003) stated, all learning is interactive. Rezak (2009) stated that discovery learning is highly engaging. The findings here are also in accordance with Balim (2009), who stated that using the discovery learning method results in student success more often than the use of traditional teaching methods does.

This study also points out that the alignment and reinforcement of teaching and learning may lead to higher interaction. For example, when learners had to reflect, they had to think. The more they thought, the more they interacted. It can be said that thinking and reflection are interrelated in creating better interaction because a teacher encourages learners to think and learning is thus reinforced by the use of thinking to help reflect. Therefore, if good designs and better selections of learning activities are used, higher impacts on learner interactions can be yielded.

As a result of learning interactively, learners achieved more and were satisfied. Learners who were taught through interactive learning and learnt through discovery learning had more opportunities to enhance 21st century knowledge and skills than those who did not have such opportunities. As Pack (2016) stated, the only way to develop 21st century skills is to exercise them.

RECOMMENDATIONS

It is recommended that teachers create interactive learning environments for interactive learning and discovery learning to take place as the research results show that interactive learning and discovery learning had high impacts on student interaction and promoted successful learning as measured by student achievement and satisfaction. However, to be successfully implemented, the following specific recommendations should be followed:

1. Using interactive learning books requires learner self-discipline as the learners must bring the book to class. When learners forget their books and do the exercises on separate sheets of paper, they have to work on the same task twice. Changing from paper

versions of interactive learning books to online versions can solve this problem as everything would be online and retrievable. Online books are also more suitable for today's learners who use technology to aid their learning.

2. Interactive learning books require learners to perform discovery to stay interactive, so working on devices with internet connections would be more appropriate as it would help learners search and discover knowledge from internet resources. However, working on an interactive learning book with other learning resources can be done as an alternative if devices with internet connections are not available.

3. Using interactive learning books requires time, especially when working on devices with internet connections as these devices can distract less self-disciplined learners from assigned tasks. Moreover, sometimes there is too much information for the learners to explore and process and learners must spend more time screening for and selecting the right knowledge. Also, more time may be needed for learners to share and discuss knowledge. In these cases, time extensions may be considered.

CONCLUSION

Interactive learning books can help build an interactive learning environment for discovery learning to take place through a variety of learning activities based on interactive learning and discovery learning. Use of these books is an effective teaching and learning strategy for engaging learners and enhancing 21st century knowledge and skills.

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